

of the Stanford Medical School has been of great value in the teaching of tuberculosis in childhood, and has helped many future practitioners of medicine to realize the importance of such an ever present medical problem.

Stanford Medical School.

## ANESTHESIA FOR CHILDREN\*

WITH REFERENCE TO ORTHOPEDIC SURGERY

By JAMES RAYMOND MARTIN, M. D.  
Los Angeles

IN the administration of anesthetics to children needing orthopedic surgery, we are confronted with two problems. First and most important, the carrying of the patient through the operation with the minimum amount of shock and undesirable postoperative effect. Second, making the anesthetic as pleasant as possible for the patient. Many of these children need several operations before the desired results are obtained, and a disagreeable anesthetic experience at the first operation may upset the whole plan of the surgeon.

### CASE RECORDS HERE REVIEWED

It is with these two problems in mind that this résumé has been prepared. It is based on the past four years' anesthetic records of the Los Angeles Orthopedic Hospital. These records cover a total of 1807 general anesthetics, including both major and minor operations, with tonsillectomy excluded. There have been no deaths. In one case a possible pneumonia followed an ether anesthetic in a little Mexican child. This patient was considered a poor risk and was complicated by a postoperative staphylococcus wound infection. Most of the anesthetics have been given by one person and all by skilled anesthetists. Only a portion of the 1807 anesthetics records have been selected for this survey. The records for 1928 were chosen because a more accurate record system has been in use in the past two years. Before discussing these records several points are worthy of mention in regard to preparation and technique. See Tables No. 1 and 2.

### PROCEDURES USED

These surgical patients have a two-day preparation during which time the usual examinations and surgical preparations are made. This is a period when the patient should be put at ease, so that the stage of excitement on entering the operating room is almost nil.

It is our rule not to hold or tie the patient on the table when the anesthetic starts. An attendant standing by is able to guide the hands away from the mask. Using nitrous oxid or ethylene induction there is seldom any resistance, especially when the eyes are allowed to remain uncovered. Patients are anesthetized on their backs regardless of the location of the operation. When it is necessary to turn a patient flat on the abdomen, a small sand bag placed under the left

shoulder and another under the left hip will lift the body enough to make breathing much easier. In this way respiratory muscles are relieved from lifting the body at each respiration, preventing respiratory fatigue. The diaphragm is not crowded up by the abdominal contents, giving more freedom for the heart action. This position does not interfere with spinal fusion or other back operations, and seems to be a great aid in the prevention of both cardiac and respiratory fatigue.

Most orthopedic operations are not emergency surgery. Therefore the operative work is done at a time when the patient is in the best physical condition. Oftentimes it is necessary to have the patients under medical care several weeks before they are considered safe risks. This care no doubt is a big factor in the ultimate results. Acute osteomyelitis, accident cases and spastic paralysis make up the larger part of the poor risks. By studying the accompanying chart, we find that, out of a total of 486 cases, some were considered A risks, some were B risks, some were C risks, and some D risks. The spastic paralysis cases are usually considered B risks because of the instability of the autonomic nervous system.

The condition of the patient at the close of the operation was found to correspond very closely to the condition when the anesthetic began. The figures show a good general condition for 88 per cent, a fair condition for 12 per cent, and a poor condition for .01 per cent. The degree of shock or circulatory depression at the close of the operation corresponds very closely to the type of surgical risk to be operated. We find: first degree, or no shock, 87 per cent; second degree shock, 12 per cent; third degree shock, .01 per cent.

The length of time and severity of the operation, the loss of blood, and the fear on the part of the child are all important factors which must be considered as producing shock. In the series here reported 165 operations were less than thirty minutes in length, with very little hemorrhage. However, this group included a number of hip reductions in infants which produced a noticeable degree of shock. There were 307 operations, ranging in time from thirty minutes to over two hours in length, including such operations as open hip reductions, ramisectomy and spinal fusions, procedures which produce a great deal of shock and considerable loss of blood.

Secondary or follow-up operations at too short intervals for recuperation also tend to produce shock and leave the patient in poor condition. The anesthetic in these patients seems to come secondary to the surgery in the postoperative effect.

### FIGURES FOR DIFFERENT ANESTHETICS

Ethylene was adopted as a routine anesthetic in this hospital early in 1927 and has since been used for all general work unless contraindicated.

In this résumé ethylene was given in 76 per cent of all the anesthetics. The full number include twelve instances when nitrous oxid was substituted while the motor saw was being used; one hundred and ten cases in which a small

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TABLE 1.—*Showing Total Number of Patients and Classification*

	Ethylene		Ethylene and Ether		Ether		Nitrous Oxid and Nitrous Oxid and Ether		Total	
Cases	251		110		60		65		486	
Risks	A	209	A	89	A	50	A	65	A	413
	B	37	B	13	B	10			B	60
	C	5	C	6					C	11
	D		D	2					D	2
Shock	1	218	1	85	1	54	1	63	1	420
	2	33	2	20	2	5	2	2	2	60
			3	3	3	1			3	4
Postoperative condition	G	209	G	99	G	38	G	64	G	430
	F	20	F	6	F	22	F	1	F	49
	P	2	P	5					P	7
Nausea	No	209	No	78	No	40	No	61	No	386
	Moderate	42	Moderate	32	Moderate	19	Moderate	4	Moderate	97
					Severe	1			Severe	1
Less than thirty minutes	85	85		17		23		40		165
More than thirty minutes		152		93		37		25		307
Urine	Negative	232	Negative	76	Negative	49	Negative	54	Negative	411
	Acetone	5	Acetone	31	Acetone	11	Acetone	6	Acetone	53
	Albumin	2							Albumin	2
			Albumen and casts	3					Albumin and casts	3

amount of ether was used to get complete relaxation in the absence of a preoperative narcotic. The addition of ether in most cases was for only a very small part of the anesthesia.

In this group appear most of the serious operations and also the largest percentage of the poor risks. Twenty-eight per cent of the children in this series were under eight years of age. Their records correspond very closely with 72 per cent that were over eight years of age. The number of male and female patients was about evenly divided and showed no noticeable differences in anesthetic reaction.

In this group receiving ethylene and including those that received a small amount of ether in

addition, we find the percentage of good condition higher at the close of the anesthetic than the per cent of good risks before operation in spite of the fact that the anesthetics were longer and the operations more severe.

A little larger per cent showed signs of shock, or circulatory depression, before they left the table, but this quickly passed off when they were returned to bed. The estimation of shock was by pulse only, the blood pressure not being taken. A large percentage of the ethylene patients vomited when the mask was removed, but this complication is not noted in the records. Only the nausea and vomiting after the patient was returned to bed was recorded. In a very small per

TABLE 2.—*Showing Totals of Table 1, Transposed into Percentages*

	Ethylene		Ethylene and Ether		Ether		Nitrous Oxid and Nitrous Oxid and Ether		Total	
Cases	251		110		60		65		486	
Risks	A	.83	A	.81	A	.83	A	1.00	A	.85
	B	.15	B	.12	B	.17			B	.123
	C	.02	C	.05					C	.023
	D		D	.008					D	.004
Shock	1	.87	1	.77	1	.90	1	.97	1	.86
	2	.13	2	.18	2	.08	2	.03	2	.12
			3	.27	3	.017			3	.008
									†	.004
Postoperative condition	G	.91	G	.90	G	.63	G	.98	G	.885
	F	.08	F	.05	F	.37	F	.02	F	.101
	P	.008	P	.05					P	.01
Nausea	No	.83	No	.11	No	.66	No	.94	No	.80
	Moderate	.17	Moderate	.29	Moderate	.37	Moderate	.06	Moderate	.20
					Severe	.02			Severe	.002
Less than thirty minutes		.39		.15		.38		.62		.34
Over thirty minutes		.61		.85		.62		.38	†	.63
										.03
Urine	Negative	.92	Negative	.69	Negative	.82	Negative	.83	Negative	.85
	Acetone	.02	Acetone	.28	Acetone	.18	Acetone	.09	Acetone	.11
	Albumin	.007							Albumin	.004
			Albumin and Casts	.03					Albumin and cast	.006
									†	.04

† Cases not recorded.

cent was this continued longer than two hours. There was a larger number in this group showing acetone the first twenty-four hours. This seems to be confined largely to the long operations and the poor risks.

Preoperative narcotic was used in 25 per cent of the cases exclusive of children under eight years of age. This is too small a number to draw any definite conclusions. However, in those cases in which it was used, the results to the patient have been favorable and, from the anesthetist's standpoint, very helpful.

Morphin and atropin have been used mostly, but recently scopolamin has been added with very gratifying results. It appears that, with more experience in its use, scopolamin may become an adjunct to anesthesia for children.

A few times a respiratory paralysis was observed. The breathing can be readily reestablished by inflating the lungs immediately with oxygen and carbon dioxid, but it must be done before the pulse begins to slow and become weak.

The group of patients who receive ether alone has become steadily smaller each month until now this group includes only 14 per cent of those anesthetized. Most of the ether anesthetics were given either by colleagues who feel a little timid about handling all patients under nitrous oxid or ethylene, or because the surgeon requested its use. Ether was also used with infants. It has been the anesthetic of choice for the infant because of the broad margin of safety.

Recently we have obtained a small mask that enables the administration of nitrous oxid and ethylene to very small children, and our results correspond with those of the older children. In this group all ages are represented and the average risks are included. Most of these were short, light anesthetics. The percentage of postoperative depression is higher than for other anesthetics. The amount of shock is less. The explanation of this may be the fact that both ether and nitrous oxid are circulatory stimulants, while ethylene is a slight depressant. The result of stopping the anesthetic removes this stimulant and a depression is noted. Acetone was present in 18 per cent of the cases receiving ether alone.

The group of patients to whom nitrous oxid or nitrous oxid and ether anesthesia was administered was considered A risk. Most of the surgical work was of a minor character, such as closed reduction of fractures, manipulation of club-feet or congenital dislocated hips. The procedures used were such that very little shock was produced, and only light anesthesia was required.

Because of the danger of explosion from ethylene when the x-ray or fluoroscope is used, nitrous oxid has been the anesthetic of choice for this type of work, ether being added for a few minutes to get relaxation if necessary. This group represents a larger proportion of minor work and should not be contrasted with the other groups where there are poorer risks, longer and deeper anesthesia, and more severe surgical shock.

Moderate nausea was noted in only four of the sixty cases. The condition of the patients after

return to bed was good in all cases except one, which was considered fair. The record of the postoperative urine findings showed 83 per cent clear, and 17 per cent showed acetone the first twenty-four hours.

#### SUMMARY

It is fully admitted that there are many valuable facts concerning the anesthesia for children which might be gleaned from further study of this small series of case records. These records represent the total series of 1807 cases, beginning with a higher percentage of ether anesthetics, while later nitrous oxid was in the lead. The past eighteen months, ethylene has been used almost as routine anesthetic.

It would seem that each anesthetic agent has its merits and its shortcomings. In this type of work the anesthetic of most merit and best suited for the individual case should be used. The physical and mental condition of the child on entering the operating room, the care and skill of administering the anesthetic, the length of time and severity of operation, are all important points to be noted just as in adult anesthesia. In conclusion, from a study of this series it would seem that the proper handling of the patient, both before and during the anesthetic, is as important as the type of anesthetic used.

746 Francisco Street.

### CARCINOMA OF THE UTERUS—ITS TREATMENT BY RADIATION\*

By ALBERT SOILAND, M. D.

AND

WILLIAM E. COSTOLOW, M. D.

Los Angeles

DISCUSSION by R. R. Newell, M. D., San Francisco; Lyell Cary Kinney, M. D., San Diego; H. J. Ullmann, M. D., Santa Barbara.

THE first radium treatment for carcinoma of the uterus was given by Abbe in New York in 1905. Following this the technique was rapidly developed in this country, and also in France, where faith in radium has remained constant and where it has largely replaced surgery. Results became better as the radium technique in carcinoma of the cervix improved, until at present it is the method of choice in practically all medical centers.

#### CLASSIFICATION ACCORDING TO EXTENT

In the consideration of the treatment of carcinoma of the cervix, it is important to group the cases according to the extent of the disease. The following grouping advised by Schmitz<sup>2</sup> is the one generally used in this country:

Group 1.—Comprises the cases in which the cancer is clearly localized to the cervix.

Group 2.—In which doubt exists as to localization. These cases usually show a doughy or

\* From the Albert Soiland Clinic, Los Angeles.

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